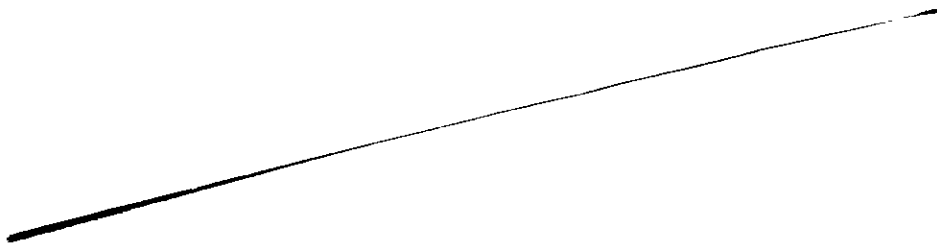


3974

C.1

LIBRARY COPY
Materials & Research Dept.

63-31



State of California
Department of Public Works
Division of Highways
Materials and Research Department

January 7, 1963

Lab. Auth. 60227-R

Mr. Bradford Crittenden
Commissioner
Highway Patrol Department
Sacramento, California

Attention: Mr. Ross Little

Dear Sir:

Submitted for your consideration as requested is a
report of our recommendations for:

NOISE LIMITS FOR MOTOR VEHICLES
WITH COMMENT ON BOLT BERANEK
AND NEWMAN REPORT NO. 824

Study made by Structural Materials Section
Under general direction of Eric F. Nordlin
Tests and report by Louis Bourget

Very truly yours,

F. N. Hveem
Materials and Research Engineer

LIBRARY COPY
Materials & Research Dept.

By *E. F. Nordlin*
E. F. Nordlin
Supervising Highway Engineer

LB:mnw

NOISE LIMITS FOR MOTOR VEHICLES
WITH COMMENT ON BOLT BERANEK
AND NEWMAN REPORT NO. 824

At the request of the California Highway Patrol Department and based on experience derived from hundreds of vehicle measurements at realistic road speeds plus controlled tests employing dynamometer test stands, the Materials and Research Department of the California Division of Highways presents the following recommendations for consideration:

For enforcement purposes it is entirely feasible to establish and measure the following maximum noise limits at 25 feet from the center of the paved lane or at 19 feet from the edge of a standard 12 foot lane.

- A. Diesel powered trucks of over 10,000 pounds gross vehicle weight, diesel busses, and all motorcycles:

90 dbA
+ 2 dbA tolerance

Violation over 92 dbA

- B. Gasoline powered trucks of over 10,000 pounds gross weight and gasoline powered busses of over 15 passenger capacity:

85 dbA
+ 2 dbA tolerance

Violation over 87 dbA

- C. Passenger vehicles other than motorcycles, gasoline powered trucks of less than 10,000 pounds gross vehicle weight, and gasoline powered busses of 15 or less passenger capacity:

80 dbA
+ 2 dbA tolerance

Violation over 82 dbA

We further recommend that vehicles of 10,000 gross weight and over be required to install acoustical lining material on all possible under surfaces of the hood including the hood side panels. The purpose is to reduce the radiation of engine compartment noise. The acoustical material so employed shall have an absorption rating of not less than .65 between 500 and 4,000 cycles per second.

The maximum noise limits must not be exceeded during any condition of vehicle operation in motion or for the acceleration test as described by the International Standards Organization (ISO).

A standing no-load test of the vehicle at maximum recommended tachometer speed, for the engine, should normally result in 3 dbA less noise than the listed maximum. The tests in motion or under acceleration (ISO) are to be preferred.

All noise measurements described are at the nearest whole number equivalent in feet (25) of the ISO distance recommendation of 7.5 meters (which is actually 24.6 feet).

The use of a sound level meter employing the A weighting network for readout in dbA and the "fast response" position of the meter switch are also in accord with ISO recommendations. The American Standards Association (ASA) is a member of the ISO group and actively participates in the establishment of ISO recommendations.

The Sound Level Meters employed shall meet all requirements of American Standard Specification S1.4-1961 of the American Standards Association. Means for acoustical calibration of the over-all Sound Level Meter, including the microphone, shall be provided either as a built-in device, or as a separate device. All equipment shall be battery operated for field use and a suitable stand or tripod shall be employed so that the microphone shall be 4 feet above the pavement of the traveled lane during measurement. This height is in practical accord with the ISO recommendation of 1.2 meters (47.246 inches).

COMMENTS ON THE BOLT, BERANEK AND NEWMAN REPORT NO. 824

OBJECTIVE LIMITS FOR MOTOR VEHICLE NOISE

The Bolt, Beranek and Newman Report No. 824 entitled "Objective Limits for Motor Vehicle Noise" is thorough and well documented with tests and analyses. In general, there is extremely close agreement between tests and conclusions presented in this report and the tests and conclusions of the Materials and Research Department through experience in recent years. For example, we have regarded 90 dbA as a desirable limit for diesel truck noise, when measured at 25 feet from the exhaust stack during actual road tests on moving vehicles. The BB & N recommendation of 100 PNdb at 50 feet from the center of the traveled lane can be translated to dbA at 25 feet as follows: reducing the distance by one-half adds 6 db for a total of 106 PNdb, subtracting 13 converts from PNdb to dbA, and the result is 93 dbA (pg. 19, BB & N report).

The Division of Highways figure of 90 dbA was developed at a 4 foot greater distance (from the exhaust stack rather than the center of the lane). Therefore, we must add 2 dbA to 90 dbA for a total of 92 dbA.

Therefore, at the same physical distance of 25 feet from the center of a truck lane we find the BB & N and the Division of Highways conclusions to be only one dbA apart for a diesel truck noise limit. This is a remarkably close agreement when the many possible variables are considered.

By the same line of reasoning, the BB & N and Division of Highways estimates for a suitable limit for passenger cars, etc. are also within one dbA at 25 feet from lane center.

You will note that we suggest a third class (in between diesel trucks and passenger cars) for gasoline powered trucks and busses. It has been our experience that gasoline powered trucks and busses produce about 5 dbA less noise than diesel trucks or busses when both are equipped with the better types of available mufflers; therefore, this classification should pose no undue problems.

We have added a requirement for the application of acoustical materials to all underside surfaces of the hood on large trucks. This is important because the radiation of excessive and unnecessary amounts of engine compartment noise has often been used as an excuse to avoid employment of high performance mufflers. Such arguments should be discouraged.

We do not feel that the strong stand taken by BB & N in support of PNdb over dbA is warranted for the measurement of motor vehicle noises. On page 19 of the BB & N report, the mean value of difference between PNdb and dbA is 13 points (db) for

any class of vehicle under any condition of measurement. That is, the PNdb figure is consistently 13 db higher than a dbA measurement within an error of plus or minus one decible. Individual cases in the report may be noted where the variation from this mean value is about 2 db but BB & N refer to variations of 3 PNdb of truck noise as "essentially the same" amount of noise on page 41, paragraph 3.

The adoption of dbA as a measurement standard will also save the State of California both time and money. All Sound Level Meters now made in compliance with American Standard Specification S1.4-1961 of the American Standards Association include the A weighting network and are ready for use without modification. This is not true if PNdb were adopted as proposed by BB & N.

Therefore we encourage the adoption of the ISO recommended dbA at 25 feet from the center of lane. We also recommend that the same noise limits for an acceleration test (ISO) be applied to vehicles in motion along the highway. This will give the California Highway Patrol a much wider field of application in carrying out the responsibilities of motor vehicle noise control.